Abstract

Methods and apparatus for releasing energy from hydrogen atoms (molecules) by stimulating their electrons to relax to quantized lower energy levels and smaller radii (smaller semimajor and semiminor axes) than the "ground state" by providing energy sinks or means to remove energy resonant with the hydrogen energy released to stimulate these transitions. An energy sink, energy hole, can be provided by the transfer of at least one electron between participating species including atoms, ions, molecules, and ionic and molecular compounds. In one embodiment, the energy hole comprises the transfer of t electrons from one or more donating species to one or more accepting species whereby the sum of the ionization energies and/or electron affinities of the electron donating species minus the sum of the ionization energies and/or electron affinities of the electron accepting species equals approximately $mX27.21\,eV$ ($mX48.6\,eV$) for atomic (molecular) hydrogen below "ground state" transitions where m and t are integers. The present invention further comprises a hydrogen spillover catalyst, a multifunctionality material having a functionality which dissociates molecular hydrogen to provide free hydrogen atoms which spill over to a functionality which supports mobile free hydrogen atoms and a functionality which can be a source of the energy holes. The energy reactor includes one of an electrolytic cell, a pressurized hydrogen gas cell, and a hydrogen gas discharge cell. A preferred pressurized hydrogen gas energy reactor comprises a vessel; a source of hydrogen; a means to control the pressure and flow of hydrogen into the vessel; a material to dissociate the molecular hydrogen into atomic hydrogen, and a material which can be a source of energy holes in the gas phase. The gaseous source of energy holes includes those that sublime, boil, and/or are volatile at the elevated operating temperature of the gas energy reactor wherein the exothermic reaction of electronic transitions of hydrogen to lower energy states occurs in the gas phase.